

ROAD DAMAGE PREDICTION FOR INTELLIGENT TRANSPORTATION SYSTEM

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MES20MCA-2058
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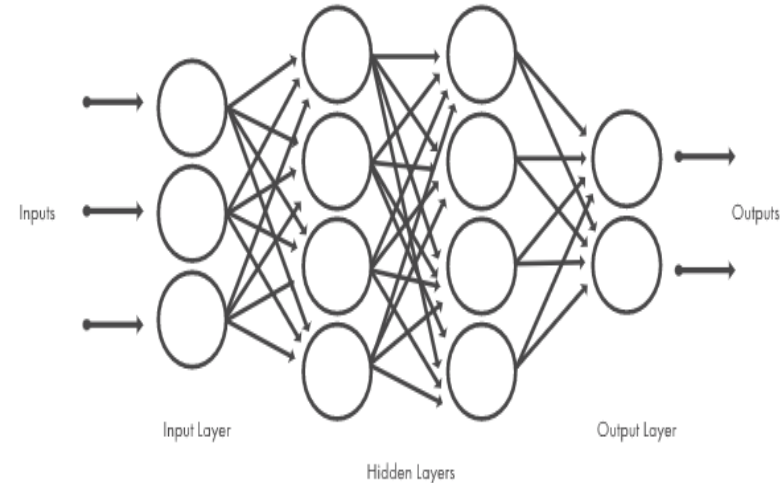
ROAD DAMAGE PREDICTION FOR INTELLIGENT TRANSPORTATION SYSTEM

A human-based road damage monitoring system could be the first answer but not a perfect solution because it is affected by a different condition such as weather, speed of the vehicle, the complexity of the road, and the difference of criteria from the individual inspection. Thus, researchers have developed much more robust and accurate automatic road surface detectors through various methods. For example, using a probabilistic relaxation technique based on 3D information, combining 2D gray-scale image and 3D laser scanning data or implementing a deep learning-based model. In this challenge, the dataset is gathered by a Smartphone based method and we evaluated with various scenarios using YOLO based on a deep learning-based algorithm. It is light-weight and fast in the object detection task, so it is available to improve the Smartphone-based model for detecting road damage. Deep learning-based technology is a good key to unlock the object detection tasks in our real world. By using deep neural networks, we could break a problem that is dangerous and very time-consuming but has to be done every day like detecting the road state. This paper describes the solution using YOLO to detect the various types of road damage in the IEEE Big Data Cup Challenge 2020. Our YOLOv5x based-solution is light-weight and fast, even it has good accuracy. We achieved an F1 score of 0.58 using our ensemble model with TTA, and it could be an adequate candidate for detecting real road damage in real-time.

METHODOLOGY

DEEP LEARNING

- Deep learning is a machine learning technique that teaches computers to do what comes naturally to humans.
- Deep learning models are trained by using large sets of labeled data and neural network architectures that learn features directly from the data without the need for manual feature extraction.
- Nowadays, deep learning has an important role in image classification. It extracts the feature maps from an input image using a neural network with hidden layers, and several deep learning networks based on Convolutional Neural Networks (CNNs), such as AlexNet , VGGNet , ResNet , etc, achieved a successful performance in the ImageNet Large Scale Visual Recognition Challenge (ILSVRC).



METHODOLOGY

DEEP LEARNING

- A main point is that object detection could be a combination of classification and localization, thus many approaches have developed to solve object detection tasks using deep learning-based technology. The detection model is trained with the image dataset which contains the bounding-boxes and the labels to detect an object. From the perspective of region proposal-based methods, they propose a region that may include the object, classify the object, refine and get rid of overlapped bounding boxes, and score them based on other objects in the input image. And there are representative region-based models such as R-CNN , Fast R-CNN , and Faster R-CNN , and they also called by two-stage object detectors.

METHODOLOGY

YOLO ALGORITHM

- YOLO(You Only Look Once) has a single neural network architecture, predicts a set of bounding boxes and class probabilities at a sitting for every test image.
- First of all, it divides the full image by several a grid with a specific size, and anchor boxes are generated in every grid of input image by predefined scale and size. Each anchor box predicts the objectness score, box center offset x, box center offset y, box width, box height, and class scores at one time in contrast to a two stage detector.
- Thus, YOLO is an extremely fast end-to-end algorithm to detect the objects, and it is called a one stage object detector. Also, the performance of YOLO has improved over the development of deep learning technology, so there are updated versions for improving the light-weight, inference speed, and accuracy.

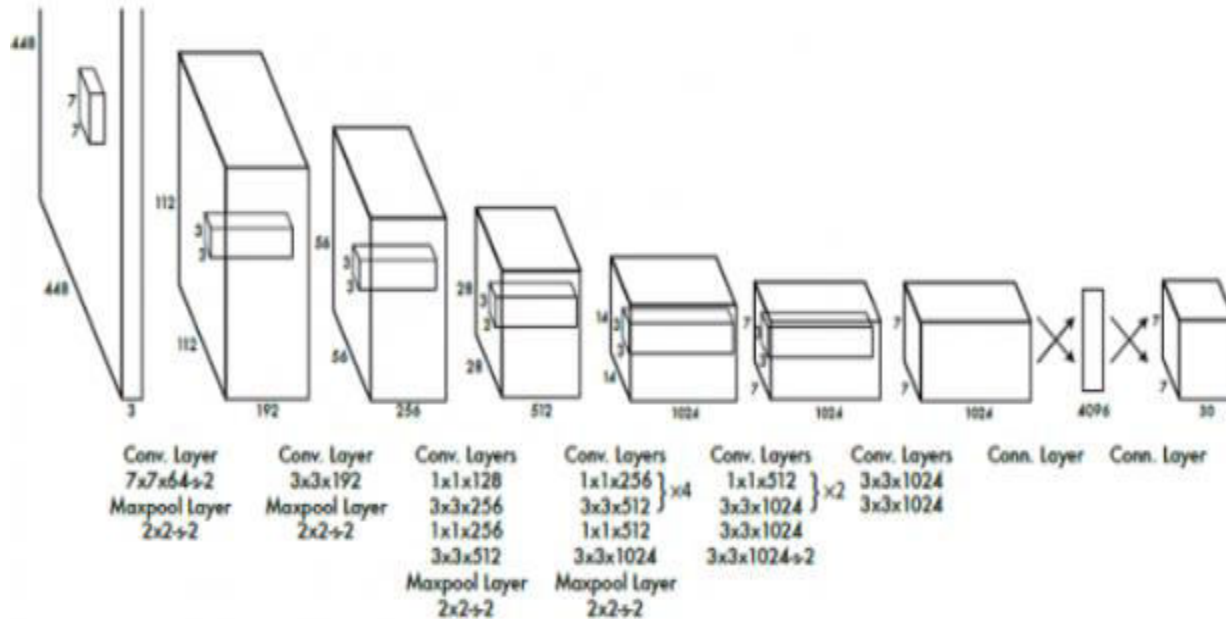


S X S grid on input



final detections

METHODOLOGY



MODULES

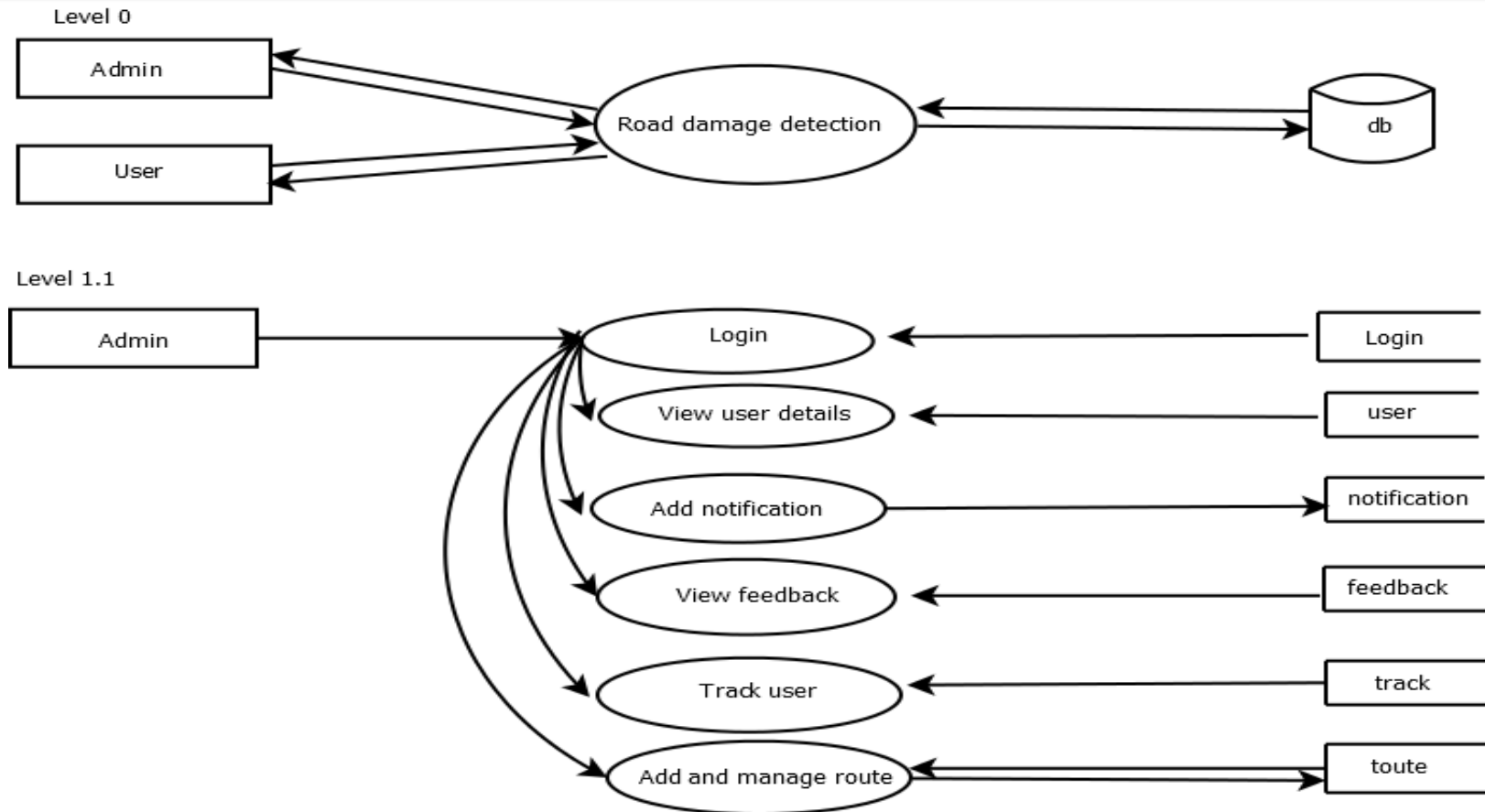
1. Admin

- Login
- View users details
- Add notification
- View feedback
- Track user
- Add and manage routs

2. User

- Register
- Login
- View profile
- Road quality alert
- feedback
- View rout

DATA FLOW DIAGRAM



DATA FLOW DIAGRAM

Level 1.2

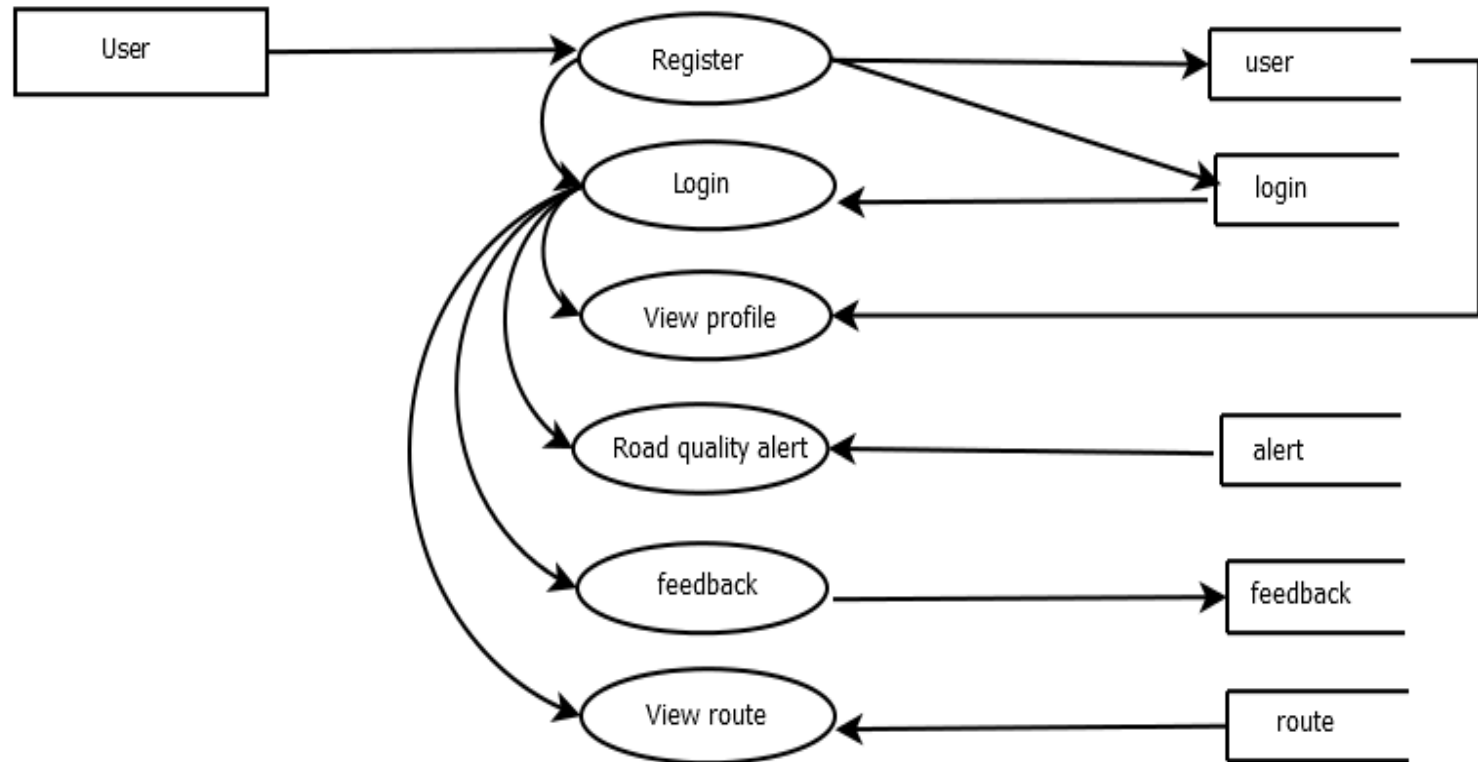


TABLE DESIGN

login

[illegible]

user

[illegible]

TABLE DESIGN

alert

[illegible]

track

[illegible]

TABLE DESIGN

route

[illegible]

feedback

[illegible]

notification

[illegible]

DEVELOPING ENVIRONMENT

- OPERATING SYSTEM : WINDOWS 10
- FRONT END : HTML, CSS, JAVASCRIPT
- BACK END : Mysql
- SOFTWARES USED : JetBrains Pycharm , Android Studio
- TECHNOLOGY USED : PYTHON, JAVA
- FRAME WORK USED : Flask

FUTURE ENHANCEMENT

- Provides alert to PWD for repair roads.

PROJECT PLAN

User Story ID	Task Name	Start Date	End Date	Days	Status
1	Sprint 1	26/12/2021	28/12/2021	10	completed
2		29/12/2021	31/12/2021		completed
3		03/01/2022	08/01/2022		completed
3	Sprint 2	09/01/2022	16/01/2022	13	Completed
4		18/01/2022	22/01/2022		Completed
5	Sprint 3	23/01/2022	27/01/2022	12	Completed
6		30/01/2022	05/02/2022		Completed
7	Sprint 4	06/02/2022	10/02/2022	9	Completed
8		16/02/2022	19/02/2022		Completed

USER STORY

User Story ID	As a type of User	I want to <perform some task>	So that I can < Achieve Some Goal>
1	Admin	Login	login successful with correct username and password
2	Admin	View User details	Can view registered users
3	Admin	Add& manage notification	Insert ,view & remove notification
4	Admin	View feedback	Can view feedbacks from user
5	Admin	Track user	Track users who are travelling
6	Admin	Add and manage rout	Can add and manage rout
7	User	Register	Can users register
8	User	Login	Registered users can login with correct username and password
9	User	View profile	View users profile in application
10	User	Road quality alert	Can get alert while travelling
11	User	Feedback	Can provide feedback
12	User	View rout	Can view rout in application

PRODUCT BACKLOG

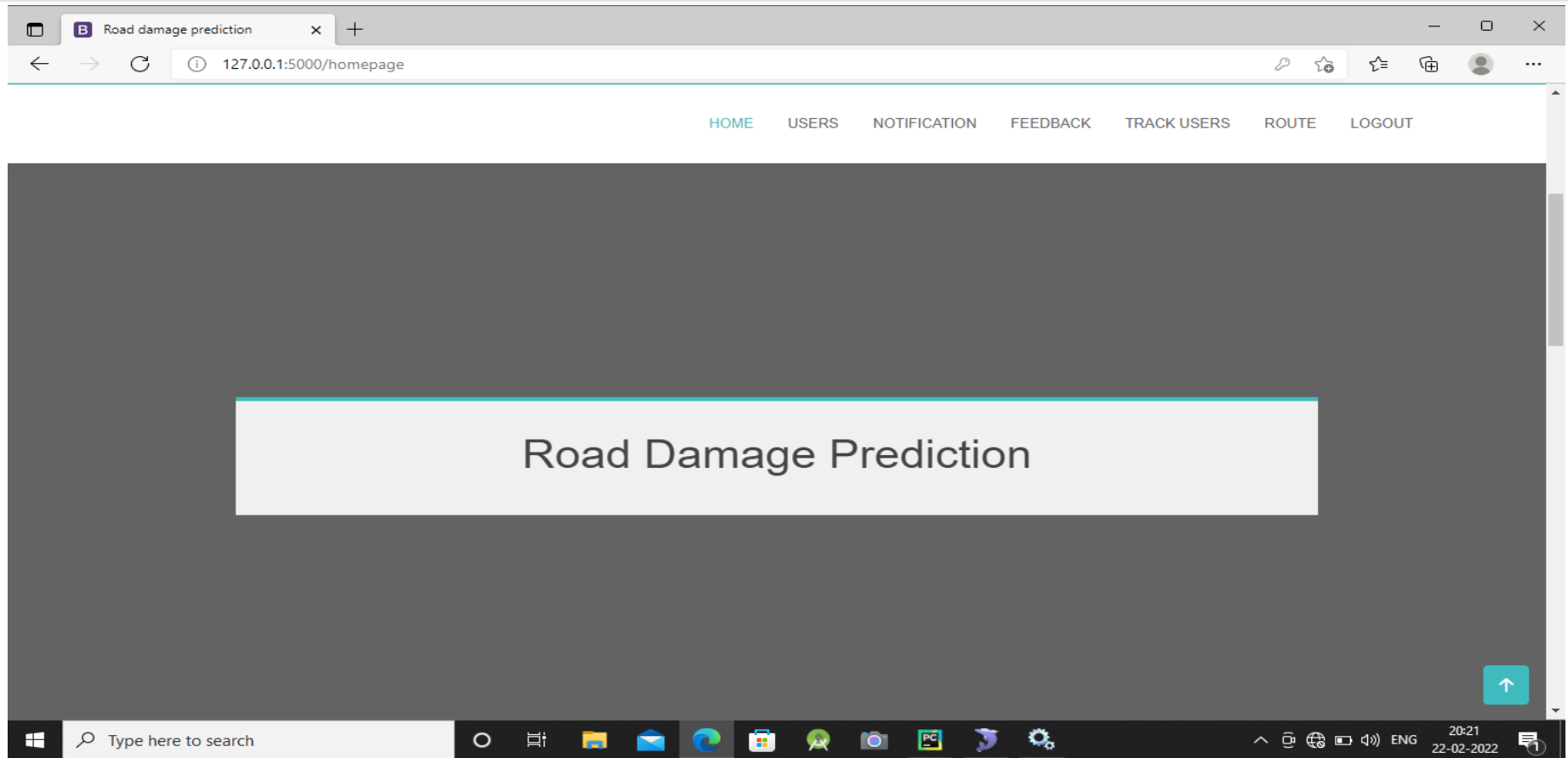
User Story ID	Priority <High/Medium/Low>	Size (Hours)	Sprint <#>	Status <Planned/In progress/Completed>	Release Date	Release Goal
1	Medium	2	1	Completed	08/01/2022	Table design
2	High	3		Completed	08/01/2022	Form design
3	High	5		Completed	08/01/2022	Basic coding
3	High	5	2	Completed	22/01/2022	Data collection
4	Medium	5		Completed	22/02/2022	Data processing
5	High	5	3	Completed	05/02/2022	Prediction
6	medium	5		Completed	05/02/2022	Location based alert
7	Medium	5	4	Completed	20/02/2022	Testing data
8	High	5		Completed	20/02/2022	Output generation

SPRINT BACKLOG

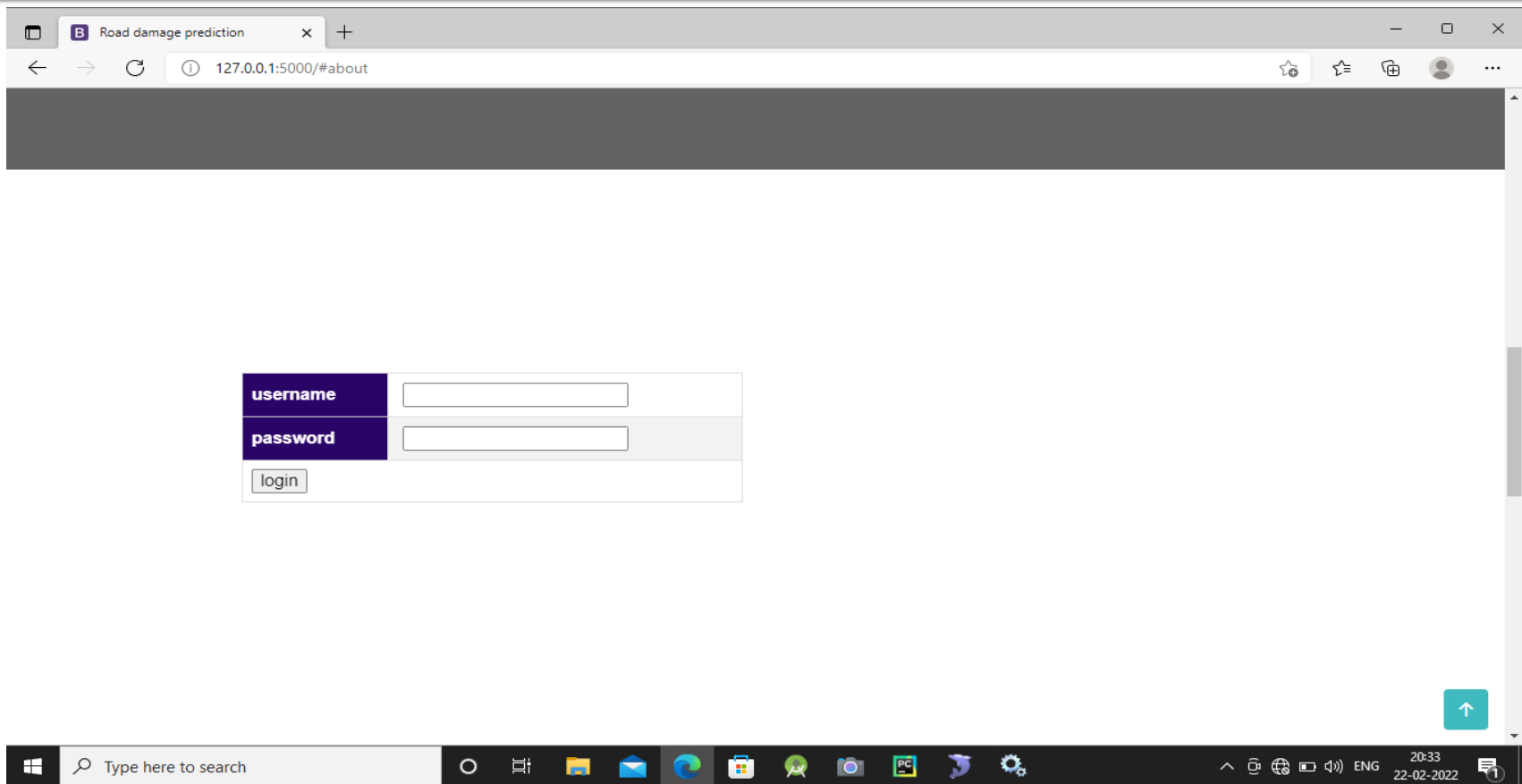
Backlog Item	Status And Completion Date	Original Estimation in Hours	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14
UserStory#1,#2,#3			hrs	hrs	hrs	hrs	hrs	hrs	hrs	hrs	hrs	hrs	hrs	hrs	hrs	hrs
Table Designing	28/12/2021	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Form Designing	31/12/2021	3	0	0	1	1	1	0	0	0	0	0	0	0	0	0
Coding	8/01/2022	5	0	0	0	0	0	1	1	1	1	1	0	0	0	0
UserStory#4, #5																
Data collection	16/01/2022	5	1	1	0	1	1	1	0	0	0	0	0	0	0	0
Data processing	22/01/2022	5	0	0	0	0	0	0	0	1	1	0	1	1	1	0
UserStory#6,#7																
Prediction	27/01/2022	5	1	1	1	0	1	1	0	0	0	0	0	0	0	0
Location based alert	5/02/2022	5	0	0	0	0	0	0	0	1	1	1	1	1	0	0
UserStory#8,#9																
Testing Data	10/02/2022	5	1	1	1	1	1	0	0	0	0	0	0	0	0	0
OutputGeneration	20/02/2022	5	0	0	0	0	0	0	2	2	1	0	0	0	0	0
Total		40	4	4	3	3	4	3	3	5	4	2	2	2	1	0

Actual Sprint																
Backlog Item	Status And Completion Date	Original Estimation in Hours	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14
UserStory#1, #2,#3			hrs	hrs	hrs	hrs	hrs	hrs	hrs	hrs	hrs	hrs	hrs	hrs	hrs	hrs
Table Designing	28/12/2021	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Form Designing	31/12/2021	4	0	0	0	1	1	0	1	1	0	0	0	0	0	0
Coding	8/01/2022	4	0	0	0	0	0	0	0	0	2	1	1	0	0	0
UserStory#4, #5																
Data collection	16/01/2022	10	2	1	1	0	1	1	1	0	1	1	0	1	0	0
Data processing	25/01/2022	10	1	1	0	1	1	0	0	1	2	0	0	1	1	1
UserStory#6, #7																
prediction	27/01/2022	5	1	1	1	1	1	0	0	0	0	0	0	0	0	0
Location based alert	05/02/2022	5	0	0	0	0	0	0	0	1	0	1	1	1	0	1
UserStory#8, #9																
Testing Data	10/02/2022	5	1	1	1	1	1	0	0	0	0	0	0	0	0	0
Output Generation	19/02/2022	5	0	0	0	0	0	0	0	0	0	2	1	1	1	0
Total		50	6	5	3	4	5	1	2	3	5	5	3	4	2	2

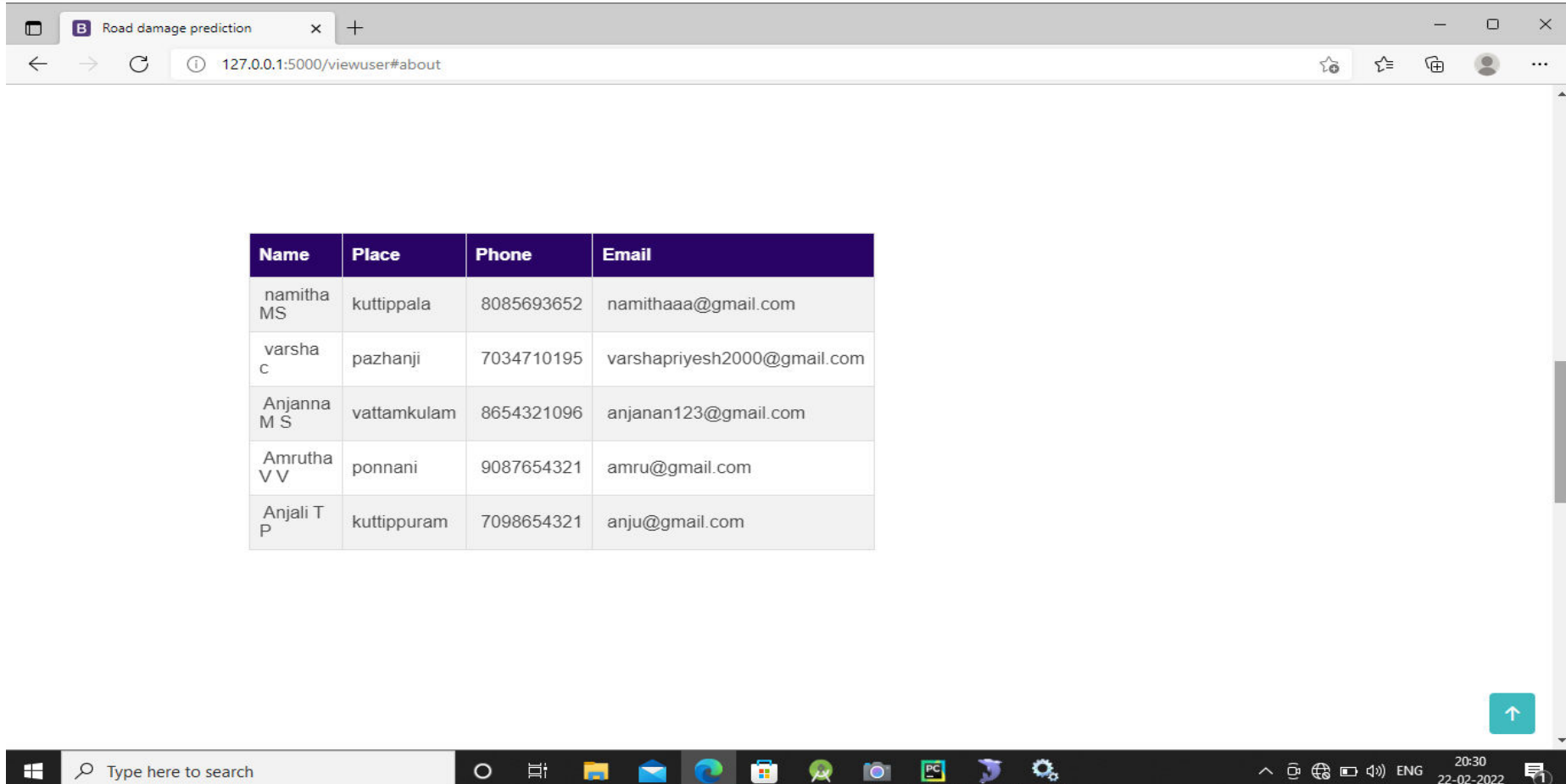
SCREENSHOTS



SCREENSHOTS



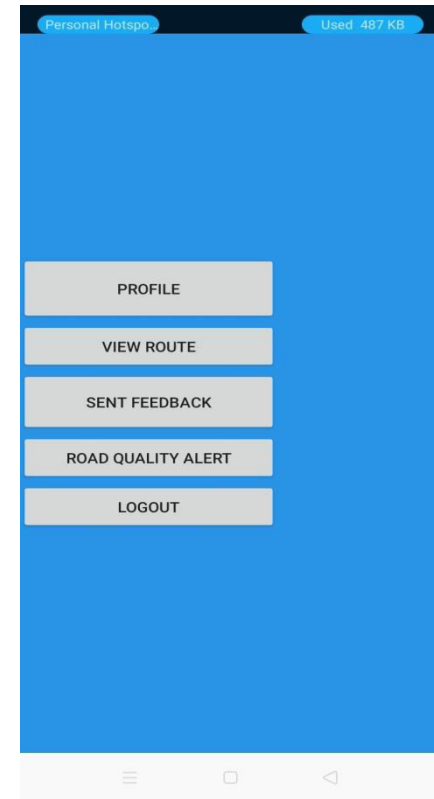
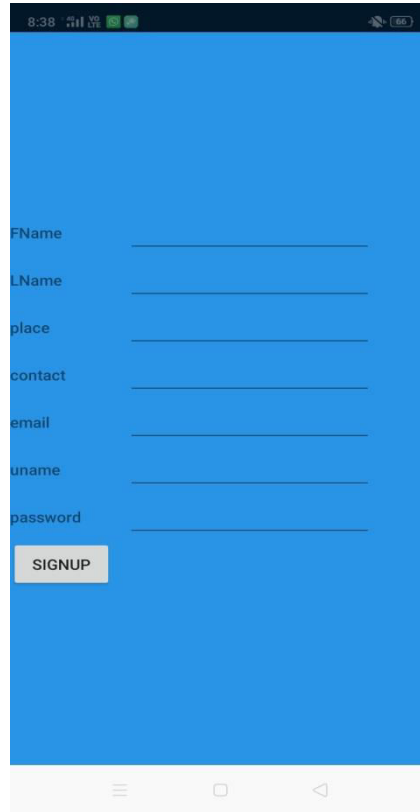
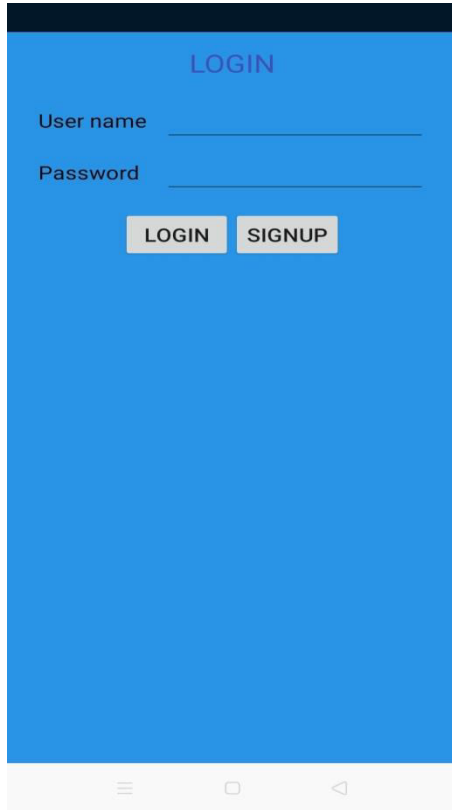
SCREENSHOTS



The screenshot shows a web browser window with a single tab titled "Road damage prediction". The address bar displays the URL "127.0.0.1:5000/viewuser#about". The main content area of the browser contains a table with four columns: Name, Place, Phone, and Email. The table lists five users with their respective details. The Windows taskbar is visible at the bottom of the screen, showing the search bar and several application icons.

Name	Place	Phone	Email
namitha MS	kuttippala	8085693652	namithaaa@gmail.com
varsha C	pazhanji	7034710195	varshapriyesh2000@gmail.com
Anjanna M S	vattamkulam	8654321096	anjanan123@gmail.com
Amrutha V V	ponnani	9087654321	amru@gmail.com
Anjali T P	kuttippuram	7098654321	anju@gmail.com

SCREENSHOTS



Thank
you

A golden quill pen is positioned to the right of the word 'you', with its tip pointing towards the end of the word. The quill has a detailed, feathered texture and a sharp, pointed nib.